Pancreatic Islet Cell Transplantation

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Related Coverage Resources

Kidney Transplantation, Pancreas-Kidney
Transplantation, and Pancreas Transplantation
Alone

INSTRUCTIONS FOR USE

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Coverage Policy

Pancreatic islet cell transplantation is considered a core medical service, not a service that falls under the transplant services benefit. As such, individuals receiving such services are NOT eligible for transplant travel benefits.

Autologous pancreatic islet cell transplantation is considered medically necessary for an individual undergoing total or near-total pancreatectomy for severe chronic pancreatitis.

Allogeneic pancreatic islet cell transplantation for the treatment of any condition is considered experimental, investigational or unproven.

Overview

This Coverage Policy addresses pancreatic islet cell transplantation.

General Background

The islets of Langerhans containing alpha, beta, and delta cells are located throughout the glandular tissue of the pancreas. Beta cells, which secrete insulin are used in islet cell transplantation and make up only 1–2% of the cells. Transplantation of autologous (same individual) beta cells has been proposed for an individual who is undergoing total or near total pancreatectomy for severe, chronic pancreatitis that is refractory to standard
therapy. Transplantation of allogeneic (cadaver) beta cells has been proposed for an individual with type I diabetes mellitus (DM) or for those with type I DM who are undergoing kidney transplantation.

**Transplantation Process**
The islet cell transplantation process involves the harvest of a single pancreas from the individual undergoing transplantation (i.e., autologous) or donor islet cells from a deceased donor or donors (i.e., allogeneic). Islet cells are separated from the pancreatic tissue by a series of enzymatic processes. The isolated islet cells are then infused into the liver by percutaneous catheter via the portal vein, or another venous tributary.

**Autologous (same individual)**
Pancreatic islet autologous transplantation may be performed following total pancreatectomy—the surgical removal of the whole pancreas—in patients with severe and chronic pancreatitis that cannot be managed by other treatments. Removal of the pancreas in individuals with chronic severe pancreatitis may eliminate the debilitating chronic pain; however, surgical removal of the pancreas results in a state of frank diabetes. The surgeon first removes the pancreas and then extracts and purifies islets from the pancreas. Within hours, the islets are infused through a catheter into the patient's liver. Pancreatic islets begin to release insulin soon after transplantation. However, full islet function and new blood vessel growth from the new islets take time. The goal of autologous islet cell transplantation is to promote insulin therapy independence and reduce potential complications of diabetes in patients who have undergone total or near-total pancreatectomy. This procedure is not considered experimental. Patients with type 1 diabetes cannot receive pancreatic islet auto-transplantation. Although the liver has been the traditional site for infusing the donor islets, researchers are investigating alternative sites, such as muscle tissue or another organ (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2014).

**Allogeneic (cadaver)**
Allogeneic transplantation is a procedure in which islets from the pancreas of a deceased organ donor(s) are purified, processed, and transferred into another person. It is proposed in the treatment of Type 1 diabetes mellitus. The goal is to give the body enough healthy islets to make insulin. Pancreatic islet allogeneic transplantation is currently considered an experimental procedure until the transplantation technology is considered successful enough to be labeled therapeutic.

**Literature Review - Autologous Islet Cell Transplantation**
The Ontario Health Technology Assessment on Pancreas Islet Transplantation for Patients With Type 1 Diabetes Mellitus (Health Quality Ontario, September 2015) found that in general, low to very low quality of evidence exists for islet transplantation in patients with type 1 diabetes with difficult-to-control blood glucose levels, with or without kidney disease, for these outcomes: health-related quality of life, secondary complications of diabetes, glycemic control, and adverse events. However, high quality of evidence exists for the specific glycemic control outcome of insulin independence compared with intensive insulin therapy. Health Quality Ontario found that for patients without kidney disease, islet transplantation improves glycemic control and diabetic complications for patients with type 1 diabetes when compared with intensive insulin therapy. However, results for health-related quality of life outcomes were mixed, and adverse events were increased compared with intensive insulin therapy. For patients with type 1 diabetes with kidney disease, islet-after-kidney transplantation or simultaneous islet-kidney transplantation also improved glycemic control and secondary diabetic complications, although the evidence was more limited for this patient group. Compared with intensive insulin therapy, adverse events for islet-after-kidney transplantation or simultaneous islet-kidney transplantation were increased, but were in general less severe than with whole pancreas transplantation. Health Quality Ontario concluded that for patients with type 1 diabetes with difficult-to-control blood glucose levels, islet transplantation may be a beneficial β-cell replacement therapy to improve glycemic control and secondary complications of diabetes. However, there is uncertainty in the estimates of effectiveness because of the generally low quality of evidence.

Wu et al. (2015) conducted a systematic review and meta-analysis of islet autotransplantation after total pancreatectomy in chronic pancreatitis patients. Twelve studies reporting the outcomes of 677 patients (mean age was 37.7 years, duration of pancreatitis 6.6 years) were included. Case reports and cohort studies with less than five patients or have a median length of follow-up less than 6 months were excluded. There were no RCT studies for analysis due to the ethical reasons of this procedure. The insulin independence rate at 1 year follow-
up was 28.4% of 362 patients reported by five studies. The insulin independence rate at 2 year follow-up was 19.7% of 297 patients reported by three studies. The insulin independent rate for islet autotransplantation after total pancreatectomy at last follow-up was 3.72 per 100 person-years. The incidence density of mortality was 1.09 per 100 person-years. The 30-day mortality was 2.1%. The authors concluded islet autotransplantation can prevent brittle diabetes mellitus and improve patients’ quality of life.

Bramis et al. (2012) performed a systematic review of five studies reporting outcomes for total pancreatectomy and islet autotransplantation for chronic pancreatitis. The techniques reported for pancreatectomy and islet cell isolation varied between studies. Total pancreatectomy/islet autotransplantation was successful in reducing pain in patients with chronic pancreatitis. The rate of insulin independence ranged from 46% at five-years to 10% at eight-year follow-up. The impact on quality of life was poorly reported. Data suggest that islet autotransplantation after total pancreatectomy results in a decrease in exogenous insulin requirements as evidenced by insulin independence at five to eight years.

Dong et al. (2011) reported results of a systematic review and metaanalysis of 15 observational studies examining the rate of insulin independence (II) and mortality after islet autotransplantation (IAT) post-total (TP) or partial pancreatectomy (PP). The II rates for IAT post-TP at last follow-up and transiently during the study were 4.62 per 100 person-years (95% CI: 1.53–7.72) and 8.34 per 100 person-years (95% CI: 3.32–13.37), respectively. The 30-day mortality for IAT post-TP and post-PP was 5% (95% CI: 2–10%) and 0, respectively. Long-term mortality was 1.38 per 100 person years (95% CI: 0.66–2.11) and 0.70 per 100 person-years (95% CI: 0.00–1.80) respectively. The data suggest that IAT post pancreatectomy offers insulin independence.

Bellin et al. (2011) compared islet function between eight allogeneic and eight autologous islet transplantation recipients at a similar duration post transplant. The two groups differed significantly only in the transplanted islet mass (i.e., autologous: 4589 +/- 1233 IE/kg, allogeneic: 9929 +/- 6246 IE/kg). Eleven healthy controls were matched to the allogeneic islet transplantation group for age, body mass index, and gender. The glycemic response to oral glucose tolerance testing, acute insulin response to glucose, and the acute insulin response to arginine did not differ significantly between islet allograft and autograft recipients, despite the autograft group receiving less than one-half the number of transplanted islets. The authors note "Better preservation of islet mass in the autograft setting is likely related to the lack of autoimmunity, alloimmunity, and immunosuppressive drug toxicity, highlighting the potential for better outcomes in islet allotransplant for type 1 diabetes mellitus with refinements in immunosuppression."

Several retrospective reviews and case series have demonstrated the effectiveness of islet cell autotransplantation in preserving endocrine function in individuals undergoing total or near total pancreatectomy. In all patients, islet cell yield was high and 32%–70% of patients achieved complete insulin independence, with five-year insulin independence rates of 47% in the study by Sutherland (Garcea, 2009; Sutherland, 2008; Grussnner, 2004; Clayton, 2003; Rodriguez Rilo, 2003).

Although not robust, the data suggest effectiveness in preventing or reducing the impact of surgical diabetes by promoting a mechanism for internal insulin production in individuals who undergo islet cell autotransplantation after near total or total pancreatectomy. Autologous islet cell transplantation is considered a reasonable treatment option for these individuals.

Literature Review - Allogeneic Islet Cell Transplantation

Although pancreas transplantation requires major surgery and life-long immunosuppression, it remains the gold standard for a specific population of patients who suffer from type 1 diabetes and who do not respond to conventional therapy. Allogeneic islet transplantation is a proposed alternative to pancreas transplantation; however, patient outcomes remain less than optimal and significant progress is required in order for this procedure to be considered a reliable therapy (Vardanyan, 2010). Although short-term improvement in metabolic control and hypoglycemic unawareness has been noted, sustainable insulin independence has not been achieved in a majority of study participants. Contributing factors may include autoimmune destruction of the transplanted cells, alloimmune rejection of the donor tissue, and toxicity of immunosuppressive drug regimens (Bellin, 2011). There remain unresolved concerns including the duration of islet cell function, limited islet supply, and effect of islet cell transplantation on the incidence and progression of diabetic complications in recipients, and the risk of transmission of adventitious disease if multiple donors are used. Additionally, long-term effects of
immunosuppressant therapy, variance in study protocols, including participant eligibility criteria and differing immunosuppressive regimens, and inconsistency in islet isolation and infusion techniques are issues that require resolution.

A number of small nonrandomized prospective and retrospective trials have demonstrated short-term insulin independence. Insulin independence ranging from 44%-60%, 33.3%, and 10-24%, at one-, two, and five-years, respectively, have been reported (Qi, et al., 2014; Fiorina and Secchi, 2007; Meloche, 2007; Shapiro, et al., 2006; Ryan, et al., 2005; Froud, et al., 2005).

Further data are needed to demonstrate the long-term safety and effectiveness of allogeneic islet cell transplantation. At this time the role of allogeneic islet cell transplantation has not been established for any indication, including the treatment of type I diabetes mellitus.

**Professional Societies/Organizations**
The American College of Gastroenterology (ACG) guidelines and the American Gastroenterological Association (AGA) guidelines do not address islet cell transplantation.

**American Diabetes Association (ADA):** The ADA Standards of Medical Care in Diabetes (2017) states that pancreas and islet transplantation have been shown to normalize glucose levels but require lifelong immunosuppression to prevent graft rejection and recurrence of autoimmune islet destruction. Islet transplantation remains investigational. Autoislet transplantation may be considered for patients requiring total pancreatectomy for medically refractory chronic pancreatitis (ADA, 2017).

**Use Outside of the US**
**Canadian Diabetes Association:** The Canadian Diabetes Association Clinical Practice Guidelines Expert Committee listed three key messages in their 2013 Clinical Practice Guideline on Pancreas and Islet Transplantation:

- Simultaneous pancreas kidney transplantation in persons with type 1 diabetes and end stage renal disease can improve kidney graft survival and result in prolonged insulin independence.
- Successful pancreas or islet allotransplantation can stabilize glucose and possibly result in insulin independence in persons with type 1 diabetes and glycemic lability or recurrent hypoglycemia.
- Islet autotransplantation can stabilize glucose and possibly result in insulin independence in people undergoing total pancreatectomy for benign pancreatic disease.

**Collaborative Islet Transplant Registry (CITR):** As of December 31, 2013, the CITR Registry included data on 1,011 allogeneic islet transplant recipients, who received 1,927 infusions from 2,421 donors. The North American sites contributed 55%, while the European and Australian sites contributed 45% of the data.

**National Institute for Health and Care Excellence (NICE):** The NICE guidance on referral for islet or pancreas transplantation in Type 1 diabetes in adults (2016) states:

- Consider referring adults with type 1 diabetes who have recurrent severe hypoglycaemia that has not responded to other treatments (see section 1.10) to a centre that assesses people for islet and/or pancreas transplantation.
- Consider islet or pancreas transplantation for adults with type 1 diabetes with suboptimal diabetes control who have had a renal transplant and are currently on immunosuppressive therapy.

**Coding/Billing Information**

**Note:** 1) This list of codes may not be all-inclusive.
   2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

**Considered Medically Necessary when criteria in the applicable policy statements listed above are met:**
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<th>CPT®* Codes</th>
<th>Description</th>
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<tbody>
<tr>
<td>48160</td>
<td>Pancreatectomy, total or subtotal, with autologous transplantation of pancreas or pancreatic islet cells</td>
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<td>G0341</td>
<td>Percutaneous islet cell transplant, includes portal vein catheterization and infusion</td>
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<td>G0342</td>
<td>Laparoscopy for islet cell transplant, includes portal vein catheterization and infusion</td>
</tr>
<tr>
<td>G0343</td>
<td>Laparotomy for islet cell transplant, includes portal vein catheterization and infusion</td>
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Consider Experimental/Investigational/Unproven:

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<tr>
<td>S2102</td>
<td>Islet cell tissue transplant from pancreas; allogeneic</td>
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References


